

Study on Motivation in Healthcare Treatment Using a Networked Healthcare Guidance System

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Abstract. To support the continuing effort towards improving healthcare, we have developed a computer system that enables patients and healthcare counselors to access data such as weight and the number of steps walked, which is uploaded by patients allowing counselors to advise patients based on their patients' healthcare records using a video phone. A six-month trial was performed to evaluate the effectiveness of the system. From the daily-uploaded data, 70% of the patients continued to upload their data until the end of the trial. According to the results of the questionnaire, half of the patients underwent a behavioral change based on the Transtheoretical Model [1]. We found that having a clear goal, checking data daily, and continuous support provided by healthcare counselors motivate patients to continue a particular regimen.

Keywords: behavior modification, healthcare guidance, IT, network.

1 Introduction

Metabolic syndrome increases the risk of developing cardiovascular disease and diabetes [2]. To decrease the incidence rate of metabolic syndrome, and to reduce the cost of medical care, a government program of specific medical checkups and health guidance started in April 2008, in Japan. People who are diagnosed at these medical checkups receive specific health guidance for six months to change their lifestyle habits. Lifestyle habits, such as physical activities and eating, have to change to prevent the ingravescence of metabolic syndrome. However, changing lifestyle habits require a continued effort.

As we hypothesized that visualizing the daily regimen with an IT system would support such continuation, we have developed a computer system that enables patients and healthcare counselors to access data such as weight and the number of steps walked which is uploaded by patients allowing counselors to advise patients based on their patients' healthcare records using a video phone. A six-month trial was performed to evaluate the effectiveness of the system.

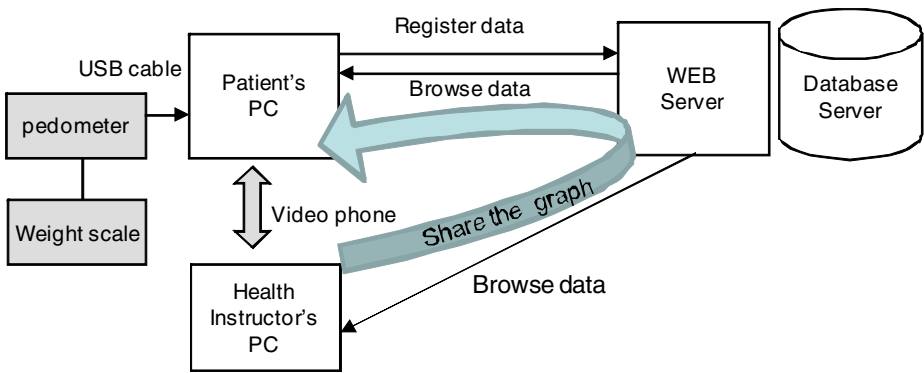


Fig. 1. Configuration of Networked Healthcare Guidance System

2 Methodology

2.1 Networked Healthcare Guidance System

Our healthcare guidance system is composed of a web server, a database server, and patient terminals (PCs or IP video phones), as shown in Fig. 1.

This system makes it easy to upload measurements, and the image sharing function can be used while talking with the patient on a video phone. Measurements are shown as summary data (graphs: week/month/aggregate period) by connecting measuring equipment to a patient terminal with a USB cable. The healthcare counselors were able to see this data and offer advice.

Measurements are plotted as graphs in Fig. 2.

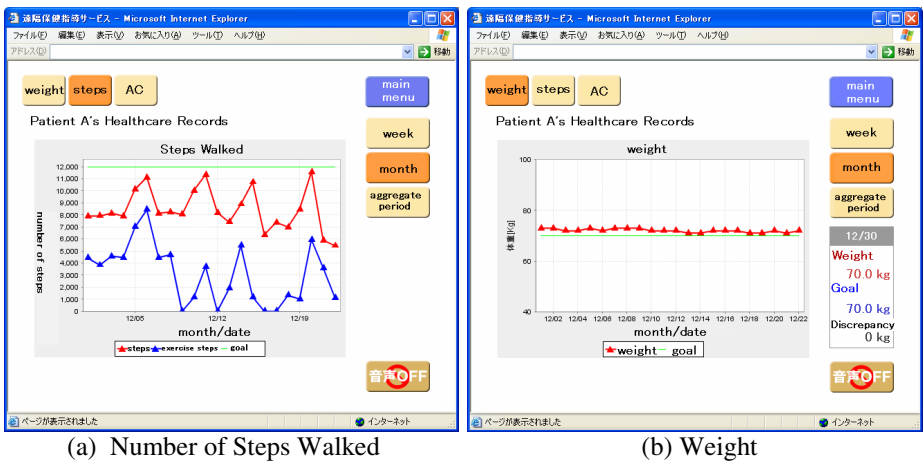


Fig. 2. Screenshots of graphs (AC = abdominal circumference)

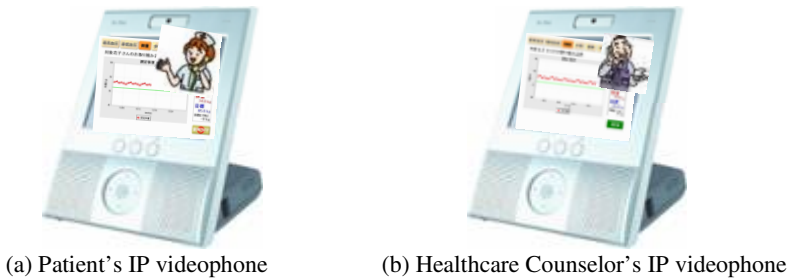


Fig. 3. IP phone terminal used for health guidance: Flet's Phone¹ VP1000 – IP video phone, internet access, and touch panel operation are available

2.2 Six-Month Trial

The six-month trial was held from March to August 2008 in Nakatsugawa City, Gifu Prefecture, Japan. Gifu Prefecture is located in central Japan. The city has a population of 86,141 (as of December 31, 2006) and covers an area of 676.38 square kilometers. In the northern part of the prefecture there is a range of high mountains, and 80% of the city's total area is covered with forest. Because of its mountainous area, broad band network service was not available in some areas in Nakatsugawa City. The local government was concerned about the information disparity between the areas, and decided to build IT infrastructures throughout the city. Now they are gradually laying optical fibers, and broad band service will be available in all areas by 2010.

The subjects were patients and healthcare counselors. 46 patients were recruited as subjects and 25 were in the control group. The average age of the patients was 46 and ranged from 23 to 61. The majority of the subject patients were Nakatsugawa City Hall employees (44 male and 2 female). There were 12 healthcare counselors, eight were from the city government (City Hall), three were from Sakashita City Hospital (a 30-minute drive from City Hall), and one was from Nakatsugawa Municipal General Hospital (a 10-minute drive from City Hall).

First, a healthcare counselor interviewed a patient. The counselor explained the patient's check-up data and his/her health status. Then, the counselor and the patient agreed to what he/she would do (how many steps a day he/she would try to walk) in the next six months. After the interview, the patient started a healthcare trial. The patient tried to walk with a pedometer everyday and measure his/her weight in the morning. The patient uploaded this data at home or at his/her office, and the healthcare counselors provided continuous support by e-mail, telephone, or videophone. IP videophones were placed in the patients' office (City Hall) and the networked health counseling rooms in each facility. Interviews and continuous support were not provided to the control patients, who were not asked to upload any data.

¹ Flet's Phone is a registered trademark of Nippon Telegraph and Telephone East Corporation and Nippon Telegraph and Telephone West Corporation.

After the trial, we sent out questionnaires to determine the reasons for continuance and discontinuance in the program.

3 Results and Analysis

3.1 Effect of Using IT Devices

According to the results of the questionnaire, patients answered that they became more health conscious due to the use of IT devices (Fig. 4).

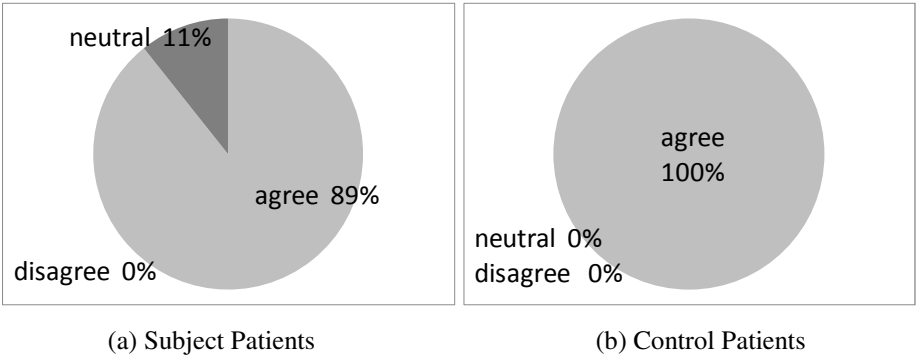


Fig. 4. Results from the question: "Do you think you have become more health conscious using IT devices in healthcare treatment?"

3.2 Result of Continuance

From the uploaded daily data, 44 of the 46 subject patients had uploaded their data, while 12 of the 25 control patients had uploaded the data. 30 of those 44 patients (68%) continued to upload their data until August 2008, while two of those 12 control patients (17%) continued to upload their data until August 2008 (Fig. 5).

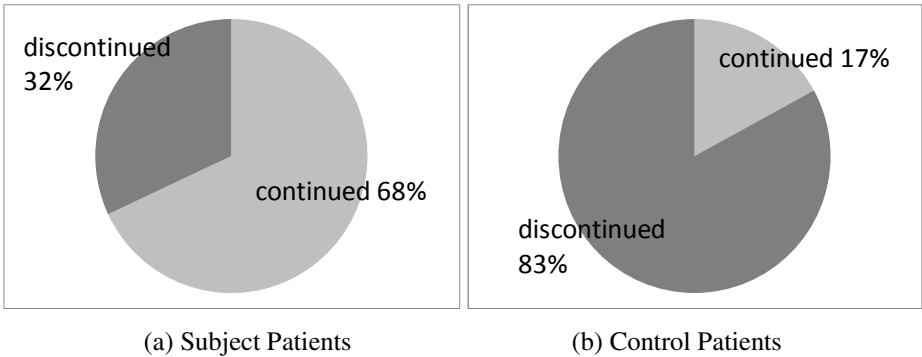


Fig. 5. Number of patients who continued to end of trial

3.3 Behavior Modification Stage

If one wishes to change a lifestyle habit, one needs to change their behavior and the new behavior needs to continue for it to become part of one's lifestyle. According to the Transtheoretical Model [1], there are five stages in behavioral change, 1: precontemplation, 2: contemplation, 3: preparation, 4: action, and 5: maintenance. According to the "Exercise and Physical Activity Guide for Health Promotion 2006" [3], these stages are described as follows:

1. Precontemplation stage: individuals who do not intend to do exercise during the next six months.
2. Contemplation stage: individuals who intend to exercise in the next six months.
3. Preparation stage: individuals who currently do not exercise a certain amount, but sometimes do a little exercise.
4. Action stage: individuals who regularly exercise a certain amount for less than six months.
5. Maintenance stage: individuals who regularly exercise a certain amount for more than six months.

28 of the 46 patients answered the questionnaire after the trial. According to the results from the questionnaires, patients' behavioral stages changed, as shown in Fig. 6.

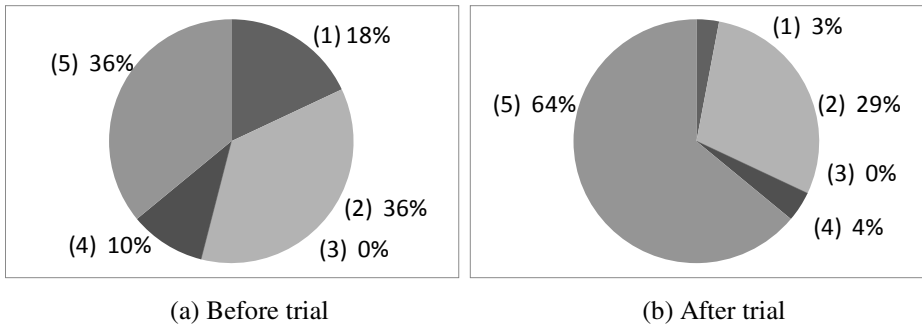


Fig. 6. Patients' behavior modification stages before and after the trial. - Before the trial, 18% percent of patients were in the precontemplation stage (1), 36% in the contemplation stage (2), 0% in the preparation stage (3), 10% in the action stage (4), and 36% percent in the maintenance stage (5). After the trial, 3% were in the precontemplation stage (1), 29% in the contemplation stage (2), 0% in the preparation stage (3), 4% in the action stage (4), and 64% in the maintenance stage (5).

14 of the 28 subject patients who responded to the questionnaire underwent a behavioral change. 19 of the 28 patients were in the maintenance stage after the trial, of which seventeen (89%) answered that they continued until the end of the trial, and thirteen of those same 19 patients (68%) answered that they lost weight through the trial.

Seven of the 25 control patients answered the questionnaire after the trial. According to the results of the questionnaire, patients' behavior stages changed, as shown in Fig. 7.

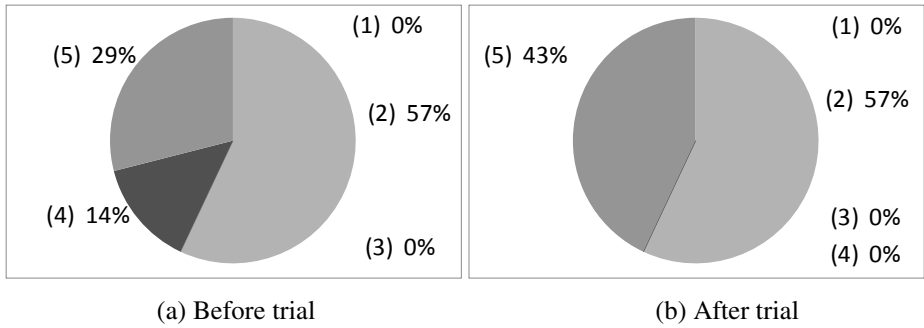


Fig. 7. Control patients' behavior modification stages before and after trial. - Before the trial, 0% percent of patients were in the precontemplation stage (1), 57% in the contemplation stage (2), 0% in the preparation stage (3), 14% in the action stage (4), and 29% percent in the maintenance stage (5). After the trial, 0% were in the precontemplation stage (1), 57% in the contemplation stage (2), 0% in the preparation stage (3), 0% in the action stage (4), and 43% in the maintenance stage (5).

One of seven patients underwent a behavioral change. Compared to the subject patients' results, we found that the control group had a much lower rate of behavioral change.

The difference between the ratio of subject patients who continued to the end of the trial and the ratio of control patients who did likewise is statistically significant ($p < .05$). In the subject patients category, the difference between the number of people who had counseling more than twice continued to the end of the trial and the number of people who had counseling less than once continued to the end of the trial is statistically significant ($p < .05$).

3.4 Reasons for Dropping Out

According to the results of the questionnaire given to the subject patients, seven of the 28 respondents answered the question to explain their reasons for dropping out. The main reason for dropping out was that they were too busy in their professional and personal lives.

As for the reasons for stopping, many patients answered that they just forgot to take data measurements. Some patients stopped taking data measurements because they could not bring weight scales with them on their vacation, as shown in Fig. 8.

Meanwhile, twenty one of the respondents answered the question to explain their reasons for continuing to participate in the questionnaire, which are as follows:

- Having a clear goal.
- Checking data daily.
- Continuous support by healthcare counselors.
- Sense of duty (due to having the trial at the office).

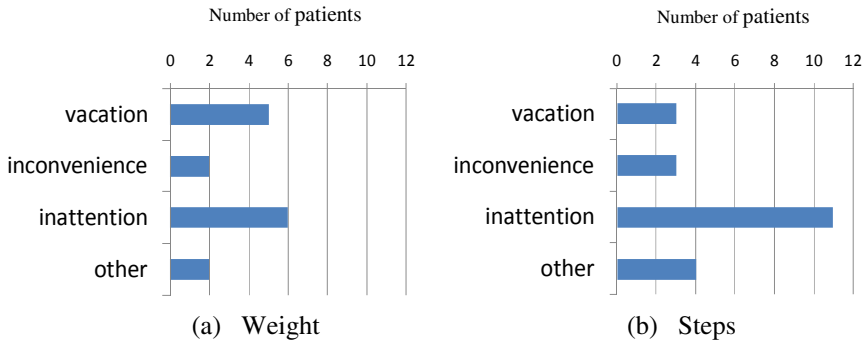


Fig. 8. Reasons for stoppages

4 Discussion

We claim that measuring one's weight and counting steps everyday, recognizing the change in the data, for example, weight loss, and thinking about the reason for this change could be motivating. Displaying this type of successful change as a graph can also be a great motivator. Nine healthcare counselors answered the questionnaire. Most of them also thought that taking measurements everyday was helpful for the patients. In addition, it is suggested that the support from healthcare counselors, for example, setting a goal at the first interview, and periodically encouraging a patient, is important to motivation.

Since the main reason for patients dropping out was that they were too busy in their professional and personal lives, we have considered having the system remind the counselors to give these patients an alternative approach.

5 Conclusion

We developed a networked healthcare guidance system to make people continue the effort. According to the results of the six-month trial, in addition to measuring data daily, continuous support is important for motivation.

In the future, we will focus on:

- providing an effective and efficient support system for encouraging one's behavior modification by creating a peer network among patients, which would enable a patient to follow the progress of his/her fellow patients.
- developing the system for following the guidelines from Continua Health Alliance.
- simplifying the uploading of vital data using Bluetooth protocol.

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